EXHIBIT-A

DRAWINGS AS AMENDED

FIG. 10A   GRAPH.ASC

```
100       PRINT: PRINT: PRINT "FILE: GRAPH.ASC"
110       CLEAR
1940      R%=INP (236): S%=R% AND 1: IF S%=1 THEN 1940        'LOCKUP
ON VERT.SYNC=1
1980      R%=INP (236): S%=R% AND 16: IF S%=0 THEN 1940      'CHECK FIELD
1990      OUT 236,64        'INITIALIZE GRAPHICS GENERATOR
1992      R%=INP (236): S%=R% AND 1
1993      IF S%=0 THEN 1992        'LOCKUP ON VERT.SYNC=0
1994      OUT 236,0                    'COMMAND LOAD, RUN-BAR
1995          OUT 238, 246: OUT 237, 0: OUT 236,128: OUT 236,0
'X-ROW MSH
1996          OUT 238, 247: OUT 237, 0: OUT 236,128: OUT 236,0
'X-ROW LSH
1997          OUT 238,242: OUT 237, 0:  OUT 236,128: OUT 236,0
'X-PIXEL SLOPE MSH
1998          OUT 238,245: OUT 237, 0:  OUT 236,128: OUT 236,0
'Y-PIXEL SLOPE MSH
1999          OUT 238,248: OUT 237, 0:  OUT 236,128: OUT 236,0
'X-ROW SLOPE MSH
2000          OUT 238,251: OUT 237, 0:  OUT 236,128: OUT 236,0
'Y-ROW SLOPE MSH
2001          OUT 238,244: OUT 237, 0:  OUT 236,128: OUT 236,0
'Y-PIXEL SLOPE LSH
2002          OUT 238,240: OUT 237, 0:  OUT 236,128: OUT 236,0
'X-ROW SLOPE LSH
2003          OUT 238,243: OUT 237, 255:  OUT 236,128: OUT 236,0
'X-PIXEL SLOPE LSH
2004          OUT 238,241: OUT 237, 255:  OUT 236,128: OUT 236,0
'Y-ROW SLOPE LSH
2005      OUT 236,80   'COMMAND RUN, LOAD-BAR ;PULSE-1 BRACKETING
COMPUTATION PERIOD
2006      R%=INP (236): S%=R% AND 1: IF S%=1 THEN 2006        'LOCKUP
ON VERT.SYNC=1
2007      R%=INP (236): S%=R% AND 16: IF S%=0 THEN 2006     'CHECK FIELD
2060      'ITERATIVE PROCESSING
2100      OUT 236,64
2140      'RESYNCHRONIZATION AND FIELD CONTROL PROCESSOR
2220      R%=INP (236): S%=R% AND 1
2300      IF S%=0 THEN 2220        'LOCKUP ON VERT.SYNC=0
3060              'INTERLACED SCAN CALCULATIONS
3100              'INPUT BYTE    128 064 032 016 008 004 002 001
3140              '                     F2      F1     LS      FS
3180      OUT 236,0                    'COMMAND LOAD, RUN-BAR
3220      R%=INP (236): S%=R% AND 16: IF S%=0 THEN 3540 ELSE 3260
'CHECK FIELD
3260                      'FIELD-2
3300          'OUTPUT  POSITION PARAMETERS
3340          OUT 238, 249: OUT 237, 0: OUT 236,128: OUT 236,0
'Y-ROW MSH
3380          OUT 238, 250: OUT 237, 4: OUT 236,128: OUT 236,0
'Y-ROW LSH
3500      GOTO 4140
```

FIG. 10B   GRAPH.ASC

```
3540                    'FIELD-1
3580        'OUTPUT  POSITION PARAMETERS
3620          OUT 238, 249: OUT 237, 0: OUT 236,128: OUT 236,0
'Y-ROW MSH
3660          OUT 238, 250: OUT 237, 0: OUT 236,128: OUT 236,0
'Y-ROW LSH
4140      OUT 236,80    'COMMAND RUN, LOAD-BAR ;PULSE-1 BRACKETING
COMPUTATION PERIOD
4220      GOTO 2060             'LOOP BACK FOR NEXT FIELD
20000     END
```

FIG. 11A LD.ASC

```
50          PRINT "ACCESSED "LD" FILE TO LOAD IMAGE MEMORY:
REV.5/15/84 09:00"
55          INPUT "MURPHY (M) OR CAMILLE (C)";K200$
100         INT1%=0: D%=0: K8%=1: K9%=1
112         PRINT: PRINT "*******************************************"
114         PRINT "    SELECT OPERATION"
116         PRINT "*******************************************": PRINT
118         PRINT "RETURN TO OPERATING SYSTEM ..................... 0"
120         PRINT "SELECT OVERLAY FOR LOADING INTO IMAGE MEMORY ... 1"
122         PRINT "SELECT IMAGE TO BE LOADED INTO IMAGE MEMORY"
124         PRINT "        CONCENTRIC SQUARE FRAMES ................. 2"
126         PRINT "        RECTANGLES AND LINES ..................... 3"
128         PRINT "        SPIRALS ................................. 4"
130         PRINT "        VIEWPORT COORDINATE SYMBOLS .............. 5"
132         PRINT "        PATTERN #6 .............................. 6"
134         PRINT "        PATTERN #7 .............................. 7"
136         PRINT "        SQUARE PATTERN  ......................... 8"
138         PRINT "        SQUARE FRAMES ........................... 9"
140         PRINT "        PERIPHERAL SQUARES ..................... 10"
141         PRINT "        PERIPHERAL TRIANGLES .................. 11"
142         PRINT "        HOUSE ................................. 12"
151         INPUT "                              SELECT OPERATION
NUMBER";A20%
152         IF A20%<13 THEN 155
153         PRINT "****************": PRINT "IMPROPER SELECTION":
PRINT "****************"
154         GOTO 112
155         IF A20%>0 THEN 158
156              SYSTEM
158         ON A20% GOSUB 170, 4400, 4530, 5500, 4500, 7500, 8500,
9000, 9040, 9180, 9280, 11070
159         GOTO 112
170         PRINT: PRINT "*******************************************"
171         PRINT "    SELECT OVERLAY FOR LOADING INTO IMAGE MEMORY"
172         PRINT "*******************************************": PRINT
173         PRINT "    RETURN TO MAIN MENU ......................... 0"
174         PRINT "    SELECT RECTANGULAR IMAGE MEMORY PATTERN"
180         PRINT "        HORIZONTAL BARS"
200         PRINT "            3-2-2 WIDTH BARS, INTENSITY VARATIONS . 1"
220         PRINT "            1-1-1 WIDTH BARS, MAXIMUM INTENSITY ... 2"
240         PRINT "            LINEAR COUNT, ALL COLOR COMBINATIONS .. 8"
260         PRINT "        SOLID SINGLE COLORED IMAGES"
265         PRINT "            RECTANGLE ............................ 3"
270         PRINT "            BACKGROUND ........................... 4"
400         PRINT "        CHECKERBOARD"
420         PRINT "            4-COLORS ............................. 6"
440         PRINT "            2-COLORS ............................. 7"
442         PRINT "        VARIABLE SINGLE COLORS"
443         PRINT "            GREEN SAWTOOTH ...................... 10"
460         PRINT "        CENTER ELEMENT"
480         PRINT "            9-PIXEL SQUARE ...................... 11"
482         PRINT "    SELECT SLOPING LINE ......................... 12"
484         INPUT "                              SELECT PATTERN
NUMBER";A5%
486         IF A5%>0 THEN 502
```

FIG. 11B LD.ASC

```
500              RETURN
502      IF A5%<13 THEN 520
503      PRINT "***************": PRINT "IMPROPER SELECTION":
PRINT "***************"
504      GOTO 170
520      IF A5%=3 OR A5%=4 OR A5%=12 THEN 523 ELSE 535
523      PRINT "COLOR CODE"
524      PRINT "        BLACK ........ 0"
526      PRINT "        GREEN ........ 1   TO   7"
527      PRINT "        RED .......... 8, 16, 24"
528      PRINT "        BLUE ......... 32, 64, 96"
529      INPUT "                              SELECT COLOR
CODE SUM";INT1%
530      IF INT1%<128 THEN 535
531      PRINT:PRINT "************************************"
532      PRINT "IMPROPER COLOR CODE; ENTER COLOR CODE AGAIN"
533      PRINT "************************************":PRINT
534      GOTO 523
535      IF A5%=11 THEN 2040
540      IF A5%=6 OR A5%=7 GOTO 560 ELSE 570
560              INPUT "CHECKERBOARD RESOLUTION, PIXELS PER
SIDE";A6%
570      IF A5%=4 THEN 575 ELSE 580
575              A5%=3: XB%=0: YB%=0: XE%=511: YE%=511: GOTO 623
580      INPUT "    START PIXEL COORDINATE";XB%,YB%
620      INPUT "    STOP  PIXEL COORDINATE";XE%,YE%
623      GOSUB 630
624      GOTO 170
630      '*******************************************************
632      'SUBROUTINE TO OVERLAY A RECTANGLE
635              XB%=(XB%+1)*8: YB%=(YB%+1)*8
640              XE%=(XE%+1)*8: YE%=(YE%+1)*8
642'     IF XB%=>8 AND XB%<XE% AND XE%=>8 AND XB%=<512*8 AND
XE%=<512*8 THEN 643 ELSE 656
643'     IF YB%=>8 AND YB%<YE% AND YE%=>8 AND YB%=<512*8 AND
YE%=<512*8 THEN 660 ELSE 656
656'     PRINT:PRINT "************************************"
657'     PRINT "IMPROPER PIXEL COORDINATES, ENTER PIXEL
COORDINATES AGAIN"
658'     PRINT "************************************":PRINT
659'     GOTO 580
660'     PRINT: PRINT "************************************"
665'     PRINT "         IMAGE MEMORY IS BEING LOADED"    'PRINT
"ROW","COLOR INTENSITY"
666'     PRINT "************************************"; PRINT
667      IF A5%=12 THEN 4200
690      XPS%=256: YPS%=0: XRP%=XB%-8
695      GOSUB 3000
700      FOR OUTLP1%=YB% TO YE% STEP 8              'ROW LOOP
710      YRP%=OUTLP1%-8               'UPDATE TO NEXT ROW
711      XRP%=XB%-8
712      GOSUB 3000                   'LOAD IMP REGISTERS
948      OUT 236,32                   'SET SEQUENTIAL LOAD COMMAND
1230   . 'DETERMINE INTENSITY (INT1%)
1240     ON A5% GOTO
```

FIG. 11C LD.ASC

```
1260,1460,1720,1250,1250,1920,1980,1800,1250,1820
1250    PRINT "*************": PRINT "SELECT A DIFFERENT IMAGE":
PRINT "*************"
1260    IF D%<8 THEN 1340       'IMAGE PATTERN 1
1280    IF D%<32 THEN 1380      ' !-64-32-!-16-08-!-04-02-01-!
1300    IF D%<128 THEN 1420     ' !  BLUE !  RED !  GREEN   !
1320    INT1%=0: D%=0: GOTO 1980
1340    INT1%=D% AND 7
1360           D%=D%+1: GOTO 1980
1380    INT1%=D% AND 24
1400           D%=D%+8: GOTO 1980
1420    INT1%=D% AND 96
1440           D%=D%+32: GOTO 1980
1460    A3%=FIX ((OUTLP1%-8)/8)                'IMAGE PATTERN 2
1480    GOSUB 1520
1500    GOTO 1980
1520    '***** SUBROUTINE, MAXIMUM COLOR ******************
1540           A4%=A3% AND 3
1560           A7%=A4%+1
1580           ON A7% GOTO 1600,1620,1640,1660
1600           INT1%=0: GOTO 1680
1620           INT1%=7: GOTO 1680
1640           INT1%=24: GOTO 1680
1660           INT1%=96
1680    RETURN
1700 '************************************************************
1720           INT1%=INT1%: GOTO 1980           'PATTERN-3, SOLID
COLOR
1800           K2%=(OUTLP1%-8)/8: INT1%= K2% AND 127: GOTO 1980
'PATTERN 8, LINEAR COUNT
1820    INT1%=K8%: K10%=K9% AND 1
1840    IF K10%=0 THEN 1920
1860           K8%=K8%+1                        'UPCOUNT, ADD
1880           IF K8%<8 THEN 1980
1900           K9%=K9%+1: K8%=6: GOTO 1980            'CHANGE
COUNT DIRECTION
1920           K8%=K8%-1              'DOWNCOUNT, SUBT
1940           IF K8%>0 THEN 1980
1960           K9%=K9%+1: K8%=2: GOTO 1980
'CHANGE COUNT DIRECTION
1980    SP1%=INIT1% AND 1: SP2%= INIT1% AND 3: SP3%=INT1% AND 7:
SP4%=INT1% AND 15: SP5%=INT1% AND 31: SP6%=INT1% AND 63:
SP7%=INT1% AND 127
1985    OUT 238, 252: OUT 237, SP1%: OUT 237, SP2%: OUT 237,
SP3%: OUT 237, SP4%: OUT 237,SP5%: OUT 237,SP6%: OUT 237, SP7%:
OUT 237, INT1%   'DATA TO LOAD IN IMAGE MEMORY
1991    ON A5% GOTO
1994,1994,1994,1994,1994,1992,1993,1994,1994,1994
1992    A3%=FIX((2*OUTLP1%+INLP1%)/A6%): GOSUB 1520: GOTO 1994
1993    A3%=FIX((2*OUTLP1%+2*INLP1%)/A6%): GOSUB 1520: GOTO 1994
1994    FOR INLP1%=XB% TO XE% STEP 8            'PIXEL LOOP
1995    OUT 236,160: OUT 236,32
1996    NEXT INLP1%
1997    OUT 237, SP7%: OUT 237, SP6%: OUT 237, SP5%: OUT 237,
SP4%: OUT 237,SP3%: OUT 237,SP2%: OUT 237, SP1%: OUT 237,0
```

FIG. 11D   LD.ASC

```
'DATA TO LOAD IN IMAGE MEMORY
1999    IF K200$="M" THEN
2000    A8%=INP (93): A8%=A8% AND 2: IF A8%=0 THEN 2009
'OPERATOR RESET
2001    A8%=INP (92): GOTO 2006
2002    A8%=INP (1): A8%=A8% AND 2: IF A8%=0 THEN 2009
'OPERATOR RESET
2003    A8%=INP (0)
2006        A9%=A8% XOR 155: IF A9%=0 THEN 100   'ESCAPE TO MENU
2007        A9%=A8% XOR 127: IF A9%=0 THEN 2008 ELSE 2009
'DELETE TO SYSTEM
2008              SYSTEM
2009    NEXT OUTLP1%
2010'   PRINT CHR$(7); :PRINT "MEMORY LOAD COMPLETE"
2020    RETURN             'RETURN TO OVERLAY MENU
2040    'PATTERN 11
2060    INT1%=7: K17%=(256-3)*8: K18%=(256+3)*8
2080    FOR OUTLP1%=K17% TO K18% STEP 8
2100       OUT 238, 249                   'Y-ROW MSH
2120         C%=FIX(OUTLP1%/64): OUT 237, C%: OUT 236,129: OUT 236,1
2140       OUT 238, 250               'Y-ROW LSH
2160         C%=OUTLP1% AND 63: OUT 237, C%: OUT 236,129: OUT 236,1
2180    FOR INLP1%=K17% TO K18% STEP 8           'PIXEL LOOP
2200       OUT 238, 246             'X-ROW MSH
2220         C%=FIX(INLP1%/64): OUT 237, C%: OUT 236,129: OUT 236,1
2240       OUT 238, 247             'X-ROW LSH
2260         C%=INLP1% AND 63: OUT 237, C%: OUT 236,129: OUT 236,1
2280       OUT 238, 252                 'DATA TO LOAD IN IMAGE MEMORY
2300    OUT 237, INT1%: OUT 236,129: OUT 236,1
2320    NEXT INLP1%
2340    NEXT OUTLP1%
2360       OUTLP1%=(256-5)*8
2380       OUT 238, 249                   'Y-ROW MSH
2400         C%=FIX(OUTLP1%/64): OUT 237, C%: OUT 236,129: OUT 236,1
2420       OUT 238, 250               'Y-ROW LSH
2440         C%=OUTLP1% AND 63: OUT 237, C%: OUT 236,129: OUT 236,1
2460    K17%=(256-6)*8: K18%=(256)*8
2480    FOR INLP1%=K17% TO K18% STEP 8            'PIXEL LOOP
2500       OUT 238, 246             'X-ROW MSH
2520         C%=FIX(INLP1%/64): OUT 237, C%: OUT 236,129: OUT 236,1
2540       OUT 238, 247                 'X-ROW LSH
2560         C%=INLP1% AND 63: OUT 237, C%: OUT 236,129: OUT 236,1
2580       OUT 238, 252                   'DATA TO LOAD IN IMAGE MEMORY
2600    OUT 237, INT1%: OUT 236,129: OUT 236,1
2620    NEXT INLP1%
2640    GOTO 2000
3000    '************ SUBROUTINE TO OUTPUT  POSITION AND SLOPE PARAMETE
3001       OUT 236,0     'D0A5 TURNED OFF TO DISABLE SEQUENCING
DURING LOADING OF REGISTERS
3002    'SLOPE SCALE FACTOR=256*PIXELS/STEP
3003    'POSITION SCALE FACTOR =8*PIXELS
3004    XPSM%=FIX(XPS%/64):     XPSL%=XPS% AND 63
3005        OUT 238,242: OUT 237,XPSM%: OUT 236,128: OUT 236,0
'X-PIXEL SLOPE MSH
3006            OUT 238,243: OUT 237,XPSL%: OUT 236,128: OUT 236,0
```

FIG. 11E   LD.ASC

```
'X-PIXEL SLOPE LSH
3007     YPSM%=FIX(YPS%/64):     YPSL%=YPS% AND 63
3008          OUT 238,245: OUT 237,YPSM%: OUT 236,128: OUT 236,0
'Y-PIXEL SLOPE MSH
3009          OUT 238,244: OUT 237,YPSL%: OUT 236,128: OUT 236,0
'Y-PIXEL SLOPE LSH
3010'    OUT 236, 0        'SUBROUTINE ENTRY POINT
3020     XRPM%=FIX(XRP%/64):     XRPL%=XRP% AND 63
3091     YRPM%=FIX(YRP%/64):     YRPL%=YRP% AND 63
'FORMAT POSITION OUTPUTS
3095          OUT 238,249: OUT 237,YRPM%: OUT 236,128: OUT 236,0
'Y-ROW MSH (Y-PIXEL MSH)
3096          OUT 238,250: OUT 237,YRPL%: OUT 236,128: OUT 236,0
'Y-ROW LSH (Y-PIXEL LSH)
3097          OUT 238,246: OUT 237,XRPM%: OUT 236,128: OUT 236,0
'X-ROW MSH (X-PIXEL MSH)
3098          OUT 238,247: OUT 237,XRPL%: OUT 236,128: OUT 236,0
'X-ROW LSH (X-PIXEL LSH)
3690     RETURN
4200     '****************************************************
4210     'DRAW A LINE
4220     DX=XE%-XB%: DY=YE%-YB%
4221     DTG=0
4222     IF DX=0 AND DY=0 THEN 4228
4224     IF ABS(DX)>ABS(DY) THEN 4227
4226     YPS%=(DY*256)/ABS(DY): XPS%=(DX*256)/ABS(DY):
DTG=ABS(DY): GOTO 4228
4227     YPS%=(DY*256)/ABS(DX): XPS%=(DX*256)/ABS(DX):
DTG=ABS(DX)
4228     XRP%=XB%-8: YRP%=YB%-8
4255     GOSUB 3000
4270     OUT 238, 252: OUT 237, INT1%          'DATA TO LOAD IN
IMAGE MEMORY
4273     OUT 236,32              'SET SEQUENTIAL LOAD COMMAND
4274     DTG=DTG+8
4276     IF DTG>8 THEN 4288
4287     OUT 236,160: OUT 236,32: GOTO 4305
4288     FOR INLP1=8 TO DTG STEP 8              'PIXEL LOOP
4290     OUT 236,160: OUT 236,32
4300     NEXT INLP1
4305     OUT 236,0              'RESET SEQUENTIAL LOAD COMMAND
4350     RETURN
4400     '****************************************************
4410     INIT1%=7: XB%=225: YB%=255: YPS%=0: XPS%=256
4420     FOR OUTLP1%=1 TO 10
4435     XRP%=XB%: YRP%=YB%
4437     XB%=XB%-1: YB%=YB%+1
4440     DX=2*OUTLP1%+1
4470     GOSUB 3000
4480     OUT 238, 252: OUT 237, INT1%          'DATA TO LOAD IN
IMAGE MEMORY
4484     OUT 236,32              'SET SEQUENTIAL LOAD COMMAND
4488     FOR INLP1=8 TO DX STEP 8              'PIXEL LOOP
4492     OUT 236,160: OUT 236,32
4493     NEXT INLP1
```

FIG. 11F   LD.ASC

```
4495    OUT 236,0              'RESET SEQUENTIAL LOAD COMMAND
4496    NEXT OUTLP1%
4497    RETURN
4500    '**********************************************
4510    'BLACK BACKGROUND WITH COORDINATE SYMBOLS
4520'   A5%=3:   INT1%=0:   XB%=0:     YB%=0:    XE%=511:  YE%=511:
GOSUB 630
4522    A5%=12:  INT1%=3:   XB%=0:     YB%=0:    XE%=0:    YE%=511:
GOSUB 630
4523    A5%=12:  INT1%=3:   XB%=0:     YB%=0:    XE%=511:  YE%=0:
GOSUB 630
4524    A5%=3:   INT1%=3:   XB%=252:   YB%=252:  XE%=258:  YE%=258:
GOSUB 630
4525    A5%=3:   INT1%=3:   XB%=250:   YB%=250:  XE%=260:  YE%=260:
GOSUB 630
4526    A5%=3:   INT1%=3:   XB%=0:     YB%=0:    XE%=10:   YE%=10:
GOSUB 630
4527    RETURN
4530    '**************************************************
4531    'RECTANGLE AND LINE PATTERN
4540    A5%=3:   INT1%=24:  XB%=100:   YB%=400:  XE%=200:  YE%=500:
GOSUB 630
4550    A5%=1:              XB%=400:   YB%=100:  XE%=500:  YE%=200:
GOSUB 630
4555    A5%=10:             XB%=100:   YB%=100:  XE%=200:  YE%=200:
GOSUB 630
4556    A5%=12:  INT1%=24:  XB%=0:     YB%=0:    XE%=511:  YE%=511:
GOSUB 630
4557    A5%=12:  INT1%=24:  XB%=0:     YB%=511:  XE%=511:  YE%=0:
GOSUB 630
4561    RETURN
5500    '**************************************************
5510    'SPIRAL LINES
5535    A5%=12:  INT1%=24:  XB%=0:     YB%=0:    XE%=10000:
YE%=200:    GOSUB 630
5540    A5%=12:  INT1%=96:  XB%=0:     YB%=511:  XE%=30000:
YE%=200:    GOSUB 630
5561    RETURN
6500    '**************************************************
6520    A5%=3:   INT1%=96:  XB%=0:     YB%=0:    XE%=511:  YE%=511:
GOSUB 630
6530    A5%=3:   INT1%=24:  XB%=100:   YB%=500:  XE%=200:  YE%=400:
GOSUB 630
6550    A5%=1:              XB%=500:   YB%=100:  XE%=400:  YE%=200:
GOSUB 630
6560    A5%=10:             XB%=100:   YB%=100:  XE%=200:  YE%=200:
GOSUB 630
6561    RETURN
7500    '**************************************************
7520    A5%=3:   INT1%=96:  XB%=0:     YB%=0:    XE%=511:  YE%=511:
GOSUB 630
7530    A5%=3:   INT1%=24:  XB%=100:   YB%=500:  XE%=200:  YE%=400:
GOSUB 630
7535    A5%=12:  INT1%=24:  XB%=0:     YB%=0:    XE%=511:  YE%=511:
GOSUB 630
```

FIG. 11G   LD.ASC

```
7540     A5%=12: INT1%=24: XB%=0:    YB%=511: XE%=511: YE%=0:
GOSUB 630
7550     A5%=1:           XB%=500: YB%=100: XE%=400: YE%=200:
GOSUB 630
7560     A5%=10:          XB%=100: YB%=100: XE%=200: YE%=200:
GOSUB 630
7561     RETURN
8500     '*********************************************************
8520     A5%=3: INT1%=96: XB%=0:    YB%=0:   XE%=511: YE%=511:
GOSUB 630
8530     A5%=3: INT1%=24: XB%=100: YB%=500: XE%=200: YE%=400:
GOSUB 630
8535     A5%=12: INT1%=24: XB%=0:   YB%=0:   XE%=511: YE%=511:
GOSUB 630
8540     A5%=12: INT1%=24: XB%=0:   YB%=511: XE%=511: YE%=0:
GOSUB 630
8550     A5%=1:           XB%=500: YB%=100: XE%=400: YE%=200:
GOSUB 630
8560     A5%=10:          XB%=100: YB%=100: XE%=200: YE%=200:
GOSUB 630
8561     RETURN
9000     '*********************************************************
9001     A5%=3: INT1%=7:  XB%=128: YB%=128: XE%=256: YE%=256:
GOSUB 630
9010     A5%=3: INT1%=16: XB%=256: YB%=128: XE%=384: YE%=256:
GOSUB 630
9020     A5%=3: INT1%=96: XB%=256: YB%=256: XE%=384: YE%=384:
GOSUB 630
9030     A5%=3: INT1%=24: XB%=128: YB%=256: XE%=256: YE%=386:
GOSUB 630
9031     RETURN
9032     '*********************************************************
9040     A5%=3: INT1%=32: XB%=0:    YB%=0:   XE%=511: YE%=511:
GOSUB 630
9050     A5%=3: INT1%=7:  XB%=104: YB%=104: XE%=127: YE%=407:
GOSUB 630
9060     A5%=3: INT1%=7:  XB%=104: YB%=104: XE%=407: YE%=127:
GOSUB 630
9070     A5%=3: INT1%=7:  XB%=104: YB%=384: XE%=407: YE%=407:
GOSUB 630
9080     A5%=3: INT1%=7:  XB%=384: YB%=104: XE%=407: YE%=407:
GOSUB 630
9090     A5%=3: INT1%=24: XB%=150: YB%=150: XE%=173: YE%=361:
GOSUB 630
9100     A5%=3: INT1%=24: XB%=150: YB%=150: XE%=361: YE%=173:
GOSUB 630
9110     A5%=3: INT1%=24: XB%=150: YB%=338: XE%=361: YE%=361:
GOSUB 630
9120     A5%=3: INT1%=24: XB%=338: YB%=150: XE%=361: YE%=361:
GOSUB 630
9130     A5%=3: INT1%=96: XB%=196: YB%=196: XE%=219: YE%=315:
GOSUB 630
9140     A5%=3: INT1%=96: XB%=196: YB%=196: XE%=315: YE%=219:
GOSUB 630
9150     A5%=3: INT1%=96: XB%=196: YB%=292: XE%=315: YE%=315:
```

FIG. 11H   LD.ASC

```
GOSUB 630
9160    A5%=3:   INT1%=96:  XB%=292:  YB%=196:  XE%=315:  YE%=315:
GOSUB 630
9170    A5%=3:   INT1%=7:   XB%=242:  YB%=242:  XE%=269:  YE%=269:
GOSUB 630
9171    RETURN
9172    '*****************************************************************
9180    A5%=3:   INT1%=96:  XB%=0:    YB%=0:    XE%=511:  YE%=511:
GOSUB 630
9190    A5%=1:              XB%=96:   YB%=96:   XE%=159:  YE%=159:
GOSUB 630
9200    A5%=1:              XB%=352:  YB%=352:  XE%=415:  YE%=415:
GOSUB 630
9210    A5%=10:             XB%=96:   YB%=352:  XE%=159:  YE%=415:
GOSUB 630
9220    A5%=10:             XB%=352:  YB%=96:   XE%=415:  YE%=159:
GOSUB 630
9230    A5%=3:   INT1%=24:  XB%=224:  YB%=224:  XE%=287:  YE%=287:
GOSUB 630
9240    A5%=12:  INT1%=7:   XB%=159:  YB%=159:  XE%=224:  YE%=224:
GOSUB 630
9250    A5%=12:  INT1%=7:   XB%=287:  YB%=287:  XE%=352:  YE%=352:
GOSUB 630
9260    A5%=12:  INT1%=7:   XB%=159:  YB%=352:  XE%=224:  YE%=287:
GOSUB 630
9270    A5%=12:  INT1%=7:   XB%=287:  YB%=224:  XE%=352:  YE%=159:
GOSUB 630
9271    RETURN
9272    '*****************************************************************
9280    A5%=3:   INT1%=96:  XB%=0:    YB%=0:    XE%=511:  YE%=511:
GOSUB 630
9300    A5%=12:  INT1%=7:   XB%=5:    YB%=6:    XE%=252:  YE%=253:
GOSUB 630
9310    A5%=12:  INT1%=7:   XB%=259:  YB%=260:  XE%=506:  YE%=507:
GOSUB 630
9320    A5%=12:  INT1%=7:   XB%=5:    YB%=507:  XE%=252:  YE%=260:
GOSUB 630
9330    A5%=12:  INT1%=7:   XB%=259:  YB%=253:  XE%=506:  YE%=6:
GOSUB 630
9340    A5%=12:  INT1%=96:  XB%=5:    YB%=5:    XE%=252:  YE%=252:
GOSUB 630
9350    A5%=12:  INT1%=96:  XB%=259:  YB%=259:  XE%=506:  YE%=506:
GOSUB 630
9360    A5%=12:  INT1%=96:  XB%=5:    YB%=506:  XE%=252:  YE%=259:
GOSUB 630
9370    A5%=12:  INT1%=96:  XB%=259:  YB%=252:  XE%=506:  YE%=5:
GOSUB 630
9380    A5%=12:  INT1%=24:  XB%=5:    YB%=4:    XE%=252:  YE%=251:
GOSUB 630
9390    A5%=12:  INT1%=24:  XB%=259:  YB%=258:  XE%=506:  YE%=505:
GOSUB 630
9400    A5%=12:  INT1%=24:  XB%=5:    YB%=505:  XE%=252:  YE%=258:
GOSUB 630
9410    A5%=12:  INT1%=24:  XB%=259:  YB%=251:  XE%=506:  YE%=4:
GOSUB 630
```

FIG. 11I   LD.ASC

```
9420    A5%=3:   INT1%=7:    XB%=0:     YB%=0:     XE%=511:   YE%=0:
GOSUB 630
9430    A5%=3:   INT1%=7:    XB%=0:     YB%=0:     XE%=0:     YE%=511:
GOSUB 630
9440    A5%=3:   INT1%=7:    XB%=511:   YB%=0:     XE%=511:   YE%=511:
GOSUB 630
9450    A5%=3:   INT1%=7:    XB%=0:     YB%=511:   XE%=511:   YE%=511:
GOSUB 630
9460    A5%=3:   INT1%=96:   XB%=1:     YB%=1:     XE%=510:   YE%=1:
GOSUB 630
9470    A5%=3:   INT1%=96:   XB%=1:     YB%=1:     XE%=1:     YE%=510:
GOSUB 630
9480    A5%=3:   INT1%=96:   XB%=510:   YB%=1:     XE%=510:   YE%=510:
GOSUB 630
9490    A5%=3:   INT1%=96:   XB%=1:     YB%=510:   XE%=510:   YE%=510:
GOSUB 630
9500    A5%=3:   INT1%=24:   XB%=2:     YB%=2:     XE%=509:   YE%=2:
GOSUB 630
9510    A5%=3:   INT1%=24:   XB%=2:     YB%=2:     XE%=2:     YE%=509:
GOSUB 630
9520    A5%=3:   INT1%=24:   XB%=509:   YB%=2:     XE%=509:   YE%=509:
GOSUB 630
9530    A5%=3:   INT1%=24:   XB%=2:     YB%=509:   XE%=509:   YE%=509:
GOSUB 630
9540    A5%=3:   INT1%=7:    XB%=3:     YB%=3:     XE%=508:   YE%=3:
GOSUB 630
9550    A5%=3:   INT1%=7:    XB%=3:     YB%=3:     XE%=3:     YE%=508:
GOSUB 630
9560    A5%=3:   INT1%=7:    XB%=508:   YB%=3:     XE%=508:   YE%=508:
GOSUB 630
9570    A5%=3:   INT1%=7:    XB%=3:     YB%=508:   XE%=508:   YE%=508:
GOSUB 630
9580    A5%=3:   INT1%=96:   XB%=4:     YB%=4:     XE%=507:   YE%=4:
GOSUB 630
9590    A5%=3:   INT1%=96:   XB%=4:     YB%=4:     XE%=4:     YE%=507:
GOSUB 630
9600    A5%=3:   INT1%=96:   XB%=507:   YB%=4:     XE%=507:   YE%=507:
GOSUB 630
9610    A5%=3:   INT1%=96:   XB%=4:     YB%=507:   XE%=507:   YE%=507:
GOSUB 630
9620    A5%=3:   INT1%=24:   XB%=5:     YB%=5:     XE%=506:   YE%=5:
GOSUB 630
9630    A5%=3:   INT1%=24:   XB%=5:     YB%=5:     XE%=5:     YE%=506:
GOSUB 630
9640    A5%=3:   INT1%=24:   XB%=506:   YB%=5:     XE%=506:   YE%=506:
GOSUB 630
9650    A5%=3:   INT1%=24:   XB%=5:     YB%=506:   XE%=506:   YE%=506:
GOSUB 630
9660    A5%=12:  INT1%=7:    XB%=192:   YB%=128:   XE%=319:   YE%=128:
GOSUB 630
9670    A5%=12:  INT1%=96:   XB%=193:   YB%=129:   XE%=318:   YE%=129:
GOSUB 630
9680    A5%=12:  INT1%=24:   XB%=194:   YB%=130:   XE%=317:   YE%=130:
GOSUB 630
9690    A5%=12:  INT1%=7:    XB%=200:   YB%=136:   XE%=311:   YE%=136:
```

FIG. 11J LD.ASC

```
GOSUB 630
9700    A5%=12: INT1%=96:  XB%=201:  YB%=137:  XE%=310:  YE%=137:
GOSUB 630
9710    A5%=12: INT1%=24:  XB%=202:  YB%=138:  XE%=309:  YE%=138:
GOSUB 630
9720    A5%=12: INT1%=7:   XB%=208:  YB%=144:  XE%=303:  YE%=144:
GOSUB 630
9730    A5%=12: INT1%=96:  XB%=209:  YB%=145:  XE%=302:  YE%=145:
GOSUB 630
9740    A5%=12: INT1%=24:  XB%=210:  YB%=146:  XE%=301:  YE%=146:
GOSUB 630
9750    A5%=12: INT1%=7:   XB%=216:  YB%=152:  XE%=295:  YE%=152:
GOSUB 630
9760    A5%=12: INT1%=96:  XB%=217:  YB%=153:  XE%=294:  YE%=153:
GOSUB 630
9770    A5%=12: INT1%=24:  XB%=218:  YB%=154:  XE%=293:  YE%=154:
GOSUB 630
9780    A5%=12: INT1%=7:   XB%=224:  YB%=160:  XE%=287:  YE%=160:
GOSUB 630
9790    A5%=12: INT1%=96:  XB%=225:  YB%=161:  XE%=286:  YE%=161:
GOSUB 630
9800    A5%=12: INT1%=24:  XB%=226:  YB%=162:  XE%=285:  YE%=162:
GOSUB 630
9810    A5%=12: INT1%=7:   XB%=232:  YB%=168:  XE%=279:  YE%=168:
GOSUB 630
9820    A5%=12: INT1%=96:  XB%=233:  YB%=169:  XE%=278:  YE%=169:
GOSUB 630
9830    A5%=12: INT1%=24:  XB%=234:  YB%=170:  XE%=277:  YE%=170:
GOSUB 630
9840    A5%=12: INT1%=7:   XB%=240:  YB%=176:  XE%=271:  YE%=176:
GOSUB 630
9850    A5%=12: INT1%=96:  XB%=241:  YB%=177:  XE%=270:  YE%=177:
GOSUB 630
9860    A5%=12: INT1%=24:  XB%=242:  YB%=178:  XE%=269:  YE%=178:
GOSUB 630
9870    A5%=12: INT1%=7:   XB%=248:  YB%=184:  XE%=263:  YE%=184:
GOSUB 630
9890    A5%=12: INT1%=96:  XB%=249:  YB%=185:  XE%=262:  YE%=185:
GOSUB 630
9900    A5%=12: INT1%=24:  XB%=250:  YB%=186:  XE%=261:  YE%=186:
GOSUB 630
9910    A5%=3:  INT1%=7:   XB%=255:  YB%=192:  XE%=256:  YE%=192:
GOSUB 630
9920    A5%=3:  INT1%=7:   XB%=255:  YB%=420:  XE%=256:  YE%=420:
GOSUB 630
9930    A5%=12: INT1%=7:   XB%=250:  YB%=426:  XE%=261:  YE%=426:
GOSUB 630
9940    A5%=12: INT1%=96:  XB%=249:  YB%=427:  XE%=262:  YE%=427:
GOSUB 630
9950    A5%=12: INT1%=24:  XB%=248:  YB%=428:  XE%=263:  YE%=428:
GOSUB 630
9960    A5%=12: INT1%=7:   XB%=242:  YB%=434:  XE%=269:  YE%=434:
GOSUB 630
9970    A5%=12: INT1%=96:  XB%=241:  YB%=435:  XE%=270:  YE%=435:
GOSUB 630
```

FIG. 11K LD.ASC

```
9980    A5%=12: INT1%=24:  XB%=240:  YB%=436:  XE%=271:  YE%=436:
GOSUB 630
9990    A5%=12: INT1%=7:   XB%=234:  YB%=442:  XE%=277:  YE%=442:
GOSUB 630
10000   A5%=12: INT1%=96:  XB%=233:  YB%=443:  XE%=278:  YE%=443:
GOSUB 630
10010   A5%=12: INT1%=24:  XB%=232:  YB%=444:  XE%=279:  YE%=444:
GOSUB 630
10020   A5%=12: INT1%=7:   XB%=226:  YB%=450:  XE%=285:  YE%=450:
GOSUB 630
10030   A5%=12: INT1%=96:  XB%=225:  YB%=451:  XE%=286:  YE%=451:
GOSUB 630
10040   A5%=12: INT1%=24:  XB%=224:  YB%=452:  XE%=287:  YE%=452:
GOSUB 630
10050   A5%=12: INT1%=7:   XB%=218:  YB%=458:  XE%=293:  YE%=458:
GOSUB 630
10060   A5%=12: INT1%=96:  XB%=217:  YB%=459:  XE%=294:  YE%=459:
GOSUB 630
10070   A5%=12: INT1%=24:  XB%=216:  YB%=460:  XE%=295:  YE%=460:
GOSUB 630
10080   A5%=12: INT1%=7:   XB%=210:  YB%=466:  XE%=301:  YE%=466:
GOSUB 630
10090   A5%=12: INT1%=96:  XB%=209:  YB%=467:  XE%=302:  YE%=467:
GOSUB 630
11000   A5%=12: INT1%=24:  XB%=208:  YB%=468:  XE%=303:  YE%=468:
GOSUB 630
11010   A5%=12: INT1%=7:   XB%=202:  YB%=474:  XE%=309:  YE%=474:
GOSUB 630
11020   A5%=12: INT1%=96:  XB%=201:  YB%=475:  XE%=310:  YE%=475:
GOSUB 630
11030   A5%=12: INT1%=24:  XB%=200:  YB%=476:  XE%=311:  YE%=476:
GOSUB 630
11040   A5%=12: INT1%=7:   XB%=194:  YB%=482:  XE%=317:  YE%=482:
GOSUB 630
11050   A5%=12: INT1%=96:  XB%=193:  YB%=483:  XE%=318:  YE%=483:
GOSUB 630
11059   A5%=12: INT1%=24:  XB%=192:  YB%=484:  XE%=319:  YE%=484:
GOSUB 630
11060   A5%=3:  INT1%=24:  XB%=248:  YB%=248:  XE%=263:  YE%=263:
GOSUB 630
11061   RETURN
11062   '*********************************************************
11070   A5%=3:  INT1%=7:   XB%=0:    YB%=0:    XE%=511:  YE%=256:
GOSUB 630
11080   A5%=3:  INT1%=96:  XB%=0:    YB%=256:  XE%=511:  YE%=511:
GOSUB 630
11090   A5%=3:  INT1%=24:  XB%=256:  YB%=128:  XE%=352:  YE%=256:
GOSUB 630
12000   A5%=3:  INT1%=16:  XB%=352:  YB%=128:  XE%=432:  YE%=256:
GOSUB 630
12010   A5%=12: INT1%=0:   XB%=256:  YB%=256:  XE%=296:  YE%=296:
GOSUB 630
12020   A5%=12: INT1%=0:   XB%=256:  YB%=255:  XE%=296:  YE%=295:
GOSUB 630
12030   A5%=12: INT1%=0:   XB%=256:  YB%=257:  XE%=296:  YE%=297:
```

```
GOSUB 630
12040    A5%=12: INT1%=0:    XB%=296:  YB%=296:  XE%=392:  YE%=296:
GOSUB 630
12050    A5%=12: INT1%=0:    XB%=296:  YB%=295:  XE%=392:  YE%=295:
GOSUB 630
12060    A5%=12: INT1%=0:    XB%=296:  YB%=397:  XE%=392:  YE%=297:
GOSUB 630
12070    A5%=12: INT1%=0:    XB%=392:  YB%=296:  XE%=352:  YE%=256:
GOSUB 630
12080    A5%=12: INT1%=0:    XB%=392:  YB%=295:  XE%=352:  YE%=255:
GOSUB 630
12090    A5%=12: INT1%=0:    XB%=392:  YB%=297:  XE%=352:  YE%=257:
GOSUB 630
13000    A5%=12: INT1%=0:    XB%=256:  YB%=256:  XE%=352:  YE%=256:
GOSUB 630
13010    A5%=12: INT1%=0:    XB%=256:  YB%=255:  XE%=352:  YE%=255:
GOSUB 630
13020    A5%=12: INT1%=0:    XB%=256:  YB%=257:  XE%=352:  YE%=257:
GOSUB 630
13030    A5%=12: INT1%=0:    XB%=256:  YB%=128:  XE%=256:  YE%=256:
GOSUB 630
13040    A5%=12: INT1%=0:    XB%=256:  YB%=127:  XE%=256:  YE%=255:
GOSUB 630
13050    A5%=12: INT1%=0:    XB%=256:  YB%=129:  XE%=256:  YE%=257:
GOSUB 630
13060    A5%=12: INT1%=0:    XB%=256:  YB%=128:  XE%=432:  YE%=128:
GOSUB 630
13070    A5%=12: INT1%=0:    XB%=256:  YB%=127:  XE%=432:  YE%=127:
GOSUB 630
13080    A5%=12: INT1%=0:    XB%=256:  YB%=129:  XE%=432:  YE%=129:
GOSUB 630
13090    A5%=12: INT1%=0:    XB%=352:  YB%=128:  XE%=352:  YE%=256:
GOSUB 630
14000    A5%=12: INT1%=0:    XB%=352:  YB%=127:  XE%=352:  YE%=255:
GOSUB 630
14010    A5%=12: INT1%=0:    XB%=352:  YB%=129:  XE%=352:  YE%=257:
GOSUB 630
14020    A5%=12: INT1%=0:    XB%=392:  YB%=296:  XE%=432:  YE%=256:
GOSUB 630
14030    A5%=12: INT1%=0:    XB%=392:  YB%=295:  XE%=432:  YE%=255:
GOSUB 630
14040    A5%=12: INT1%=0:    XB%=392:  YB%=297:  XE%=432:  YE%=257:
GOSUB 630
14050    A5%=12: INT1%=0:    XB%=432:  YB%=256:  XE%=432:  YE%=128:
GOSUB 630
14060    A5%=12: INT1%=0:    XB%=432:  YB%=255:  XE%=432:  YE%=127:
GOSUB 630
14070    A5%=12: INT1%=0:    XB%=432:  YB%=257:  XE%=432:  YE%=129:
GOSUB 630
14080    A5%=12: INT1%=127: XB%=12:   YB%=480:  XE%=12:   YE%=496:
GOSUB 630
14090    A5%=12: INT1%=127: XB%=12:   YB%=496:  XE%=16:   YE%=500:
GOSUB 630
15000    A5%=12: INT1%=127: XB%=16:   YB%=500:  XE%=32:   YE%=500:
GOSUB 630
```

FIG. 11M LD.ASC

```
15010   A5%=12: INT1%=127: XB%=32:   YB%=500:  XE%=36:  YE%=496:
GOSUB 630
15020   A5%=12: INT1%=127: XB%=36:   YB%=496:  XE%=36:  YE%=480:
GOSUB 630
15030   A5%=12: INT1%=127: XB%=36:   YB%=480:  XE%=32:  YE%=476:
GOSUB 630
15040   A5%=12: INT1%=127: XB%=32:   YB%=476:  XE%=16:  YE%=476:
GOSUB 630
15050   A5%=12: INT1%=127: XB%=16:   YB%=476:  XE%=12:  YE%=480:
GOSUB 630
15060   A5%=12: INT1%=127: XB%=6:    YB%=476:  XE%=12:  YE%=480:
GOSUB 630
15070   A5%=12: INT1%=127: XB%=6:    YB%=500:  XE%=12:  YE%=496:
GOSUB 630
15080   A5%=12: INT1%=127: XB%=12:   YB%=506:  XE%=16:  YE%=500:
GOSUB 630
15090   A5%=12: INT1%=127: XB%=36:   YB%=506:  XE%=32:  YE%=500:
GOSUB 630
16000   A5%=12: INT1%=127: XB%=42:   YB%=500:  XE%=36:  YE%=496:
GOSUB 630
16010   A5%=12: INT1%=127: XB%=36:   YB%=470:  XE%=32:  YE%=476:
GOSUB 630
16020   A5%=12: INT1%=127: XB%=12:   YB%=470:  XE%=16:  YE%=476:
GOSUB 630
16030   A5%=12: INT1%=127: XB%=42:   YB%=476:  XE%=36:  YE%=480:
GOSUB 630
16031   RETURN
16032   '**********************************************************
40000   END
```

FIG. 12A   FTR.ASC

```
10        LPRINT "FTR2.ASC"          '8/15/84        REV.8/22/4    09:30"
20        'PREFILTER THE DATABASE IMAGE
30                OPEN "R", #1, "PRESENT.BIN",128
40                FIELD 1,128 AS IA$
50        'SET UP INTEGETER CONSTANTS FOR SPEED
60        K1=1/256
70        K2=1/8
80        K3=1/32
90        RC1=0    'INITIALIZE TO ZERO
100       F5%=66              'INPUT "NUMBER OF LINES TO BE
FILTERED";F5%
110 '     INPUT "ENABLE SMOOTHING PRINTOUTS; 'Y' OR 'N'"; A15$
120 '     INPUT "ENABLE STORING PRINTOUTS; 'Y' OR 'N'"; A16$
130 '     PRINT  "SELECT FIXED WEIGHTS"
140 '     INPUT   "    SELECT STANDARD WEIGHTS;  'Y' OR 'N'"; A1$
150 '     IF A1$ = "N" THEN 680
160 '     PRINT: PRINT
170 '     PRINT "    SELECT", "  1  ", "  2  ", "  3  ": PRINT
180 '     PRINT          , "2 4 2", "4 6 4", "8 8 8"
190 '     PRINT          , "4 8 4", "6 8 6", "8 8 8"
200 '     PRINT          , "2 4 2", "4 6 4", "8 8 8"
210       A1%=3    'PRINT: INPUT "SELECT WEIGHTS '1', '2', OR '3'";A1%
220       ON A1% GOTO 260, 290, 320
230       PRINT "**************************"
240       PRINT "IMPROPER WEIGHT SELECTION, MAKE ANOTHER SELECTION"
250       PRINT "**************************": PRINT: PRINT: PRINT:
GOTO 130
260       W1% = 2: W2% = 4: W3% = 2              'WEIGHT KERNEL 1
270       W4% = 4: W5% = 8: W6% = 4
280       W7% = 2: W8% = 4: W9% = 2: GOTO 390
290       W1% = 4: W2% = 6: W3% = 4              'WEIGHT KERNEL 2
300       W4% = 6: W5% = 8: W6% = 6
310       W7% = 4: W8% = 6: W9% = 4: GOTO 390
320       W1% = 8: W2% = 8: W3% = 8              'WEIGHT KERNEL 3
330       W4% = 8: W5% = 8: W6% = 8
340       W7% = 8: W8% = 8: W9% = 8: GOTO 390
350       PRINT: PRINT   "INPUT FIXED WEIGHTS"
360       INPUT   "INPUT WEIGHTS; W1, W2, W3"; W1%, W2%, W3%
370       INPUT   "INPUT WEIGHTS; W4, W5, W6"; W4%, W5%, W6%
380       INPUT   "INPUT WEIGHTS; W7, W8, W9"; W7%, W8%, W9%
390       WTS1%=W1%+W2%+W3%+W4%+W5%+W6%+W7%+W8%+W9%        'WEIGHT
SCALE FACTOR
400       WTS2=1/WTS1%                          'RECIPROCAL
WEIGHT SCALE FACTOR
410       PRINT: PRINT ," WEIGHTS SELECTED": PRINT
420       PRINT ,"W1=";W1%, "W2=";W2%, "W3=";W3%
430       PRINT ,"W4=";W4%, "W5=";W5%, "W6=";W6%
440       PRINT ,"W7=";W7%, "W8=";W8%, "W9=";W9%, "WTS1=";WTS1%: PRINT
450       WRR2% = 0: WRG2% = 0: WRB2% = 0: S1%=0: S2%=0
460       FOR KRLP1% = 1 TO F5%    'KERNEL ROW LOOP
465       IF KRLP1% > 1 THEN TST$="Y" ELSE TST$="N"
470       LPRINT "START KERNEL ROW=";KRLP1%
480       FOR KPLP1% = 1 TO 512    'KERNEL PIXEL LOOP
490       GOSUB 1820         'TERMINAL INPUT
500       XB% = KPLP1%: YB% = KRLP1%
```

FIG. 12B   FTR.ASC

```
510     XE% = XB% + 2: YE% = YB% + 2
520     X = (XB%/128)    'FIND PIXEL COORDINATE FOR RECORD LOCATION
530     BDC = XB%: IF BDC <=128 THEN 570
540     BDC = ABS(BDC-128)         'FIND BEGINNING DATA COUNT IN RECORD
550     'IF TST$ = "Y" THEN PRINT "PIXEL LOOP ";KPLP1%
560     IF BDC>128 THEN GOTO 540
570     FOR OUTLP1% = YB% TO YE%          'LINE LOOP
580     OUT 236,1
590     GOSUB 1820
600     GOSUB 2180          'DEFINE RECORD NO.
610     'IF TST$ = "Y" THEN PRINT "OUTLP1% ";OUTLP1%
620     'IF TST$ = "Y" THEN PRINT "RC ";RC
630     IF (RC >4) AND (RC < 261) THEN 640 ELSE 710
640     RC = RC-4         'SUBTRACT 4 SO LINES GO FROM 1-64
650     IF TOGL$="T" THEN 660 ELSE 860
660        CLOSE #1
670        OPEN "R",#1,"PRESENT.BIN",128 'REOPEN PRESENT FILE IF ANOTHER
680        FIELD 1,128 AS IA$     ' FILE WAS USED
690        TOGL$="F"
700     GOTO 860
710     IF RC < 5 THEN 720 ELSE 790
720     'GET RECORD FROM PREVIOUS FILE
730        CLOSE #1
740        OPEN "R",#1,"PRIOR.BIN",128
750        FIELD 1,128 AS IA$
760        TOGL$ = "T"    'FILE MUST BE OPEN FOR INNER LOOP
770        RC=252+RC       'SET RC TO LAST LINE IN PRIOR FILE
780        GOTO 860        'GET RECORD FROM FILE
790     'ELSE
800     'GET RECORD FROM NEXT FILE
810        CLOSE #1
820        OPEN "R",#1,"NEXT.BIN",128
830        FIELD 1,128 AS IA$
840        TOGL$ = "T"     'FILE MUST BE OPEN FOR INNER LOOP
850        RC=RC-260      'SET RC TO FIRST LINE IN NEXT ;FILE
860     GET #1,RC
870     FOR INLP1% = XB% TO XE% STEP 2   'PIXEL LOOP
880     OUT 236,1: OUT 236,0
890     '          CHECK FOR EVEN BYTE STARTING ADDRESS
900     IF A15$="Y" THEN GOSUB 1970
910        IF (INLP1% = XB% ) AND ((XB% MOD 2) = 0)   THEN DC=BDC-1
920        IF (INLP1% = XB% ) AND ((XB% MOD 2) <> 0) THEN DC = BDC
930        A$=MID$(IA$,DC,2) :' GET 2 BYTES
940 'X     IF CVI(A$) = 0 THEN K%=0: GOTO 1220
950        K% = CVI(A$)'
960        PIXA% = K% AND 255 : ' GET FIRST BYTE
970        PIXB% = K% * K1 : 'GET SECOND BYTE
975     'IF TST$ = "Y" THEN PRINT "PIXA%, PIXB% ";PIXA%,PIXB%
980 'X  OUT 236,16: OUT 236,0
990     ' UNPACK RED, GREEN, AND BLUE INTENSITIES
1000    IF S1%=0 THEN 1010 ELSE 1020
1010    RDG2%=PIXB% AND 7: RDR2%=(PIXB% AND 24)*K2: RDB2%=(PIXB%
AND 96)*K3
1020    RDG1%=PIXA% AND 7: RDR1%=(PIXA% AND 24)*K2: RDB1%=(PIXA%
AND 96)*K3
```

FIG. 12C   FTR.ASC

```
1030 'X OUT 236,16: OUT 236,0
1040     S3%=OUTLP1%-YB%+1: ON S3% GOTO 1060, 1070, 1080
1050             LPRINT "ERROR AT LINE 1610
1060             WS1%=W1%: WS2%=W2%: WS3%=W3%: GOTO 1090
1070             WS1%=W4%: WS2%=W5%: WS3%=W6%: GOTO 1090
1080             WS1%=W7%: WS2%=W8%: WS3%=W9%
1090 'X OUT 236,16: OUT 236,0
1100     IF S1%=0 THEN 1140
1110     WRR2% = RDR1%*WS3% + WRR2%
1120     WRG2% = RDG1%*WS3% + WRG2%
1130     WRB2% = RDB1%*WS3% + WRB2%:              GOTO 1170
1140     WRR2% = RDR1%*WS1% + RDR2%*WS2% + WRR2%
1150     WRG2% = RDG1%*WS1% + RDG2%*WS2% + WRG2%
1160     WRB2% = RDB1%*WS1% + RDB2%*WS2% + WRB2%: S1%=1
1170 'X OUT 236,16: OUT 236,0
1180     DC=DC+2: IF DC>=128 THEN 1190 ELSE 1200 'UPDATE DATA COUNT
1190     DC=1: RC=RC+1: GET #1,RC          'CONDITIONALLY UPDATE
RECORD COUNT
1200     NEXT INLP1%
1210     S1%=0
1220     NEXT OUTLP1%
1230     OUT 236,16
1240     IF S2%>0 THEN 1280
1250     S2%=1
1260     WRR1%=WRR2%*WTS2: WRG1%=WRG2%*WTS2: WRB1%=WRB2%*WTS2
1270     IF A15$="Y" THEN GOSUB 1270: GOTO 1310
1280     WRR2%=WRR2%*WTS2: WRG2%=WRG2%*WTS2: WRB2%=WRB2%*WTS2
1290     IF A15$="Y" THEN GOSUB 2000
1300     S2%=0: GOSUB 1410                    'STORE
1310     WRR2%=0: WRG2%=0: WRB2%=0
1320     OUT 236,0
1330     NEXT KPLP1%
1340     NEXT KRLP1%
1350'    CLOSE #1
1360'    OPEN "R",#2,"FILTERED.BIN",128
1370'    FIELD 2,128 AS IB$
1380'    PUT #2,RC1
1390     CLOSE
1400     SYSTEM
1410
'------------------------------------------------------------------
1420     '
1430     '          CODE TO PUT NEW BYTES TO SPECIFIED WRITE FILE
1440     '             THE NEW BYTES SHOULD BE IN THE WRITE VARIABLES
1450     '
1460     '        CLOSE READ FILE AND OPEN WRITE FILE
1470     '
1480     '
1490     '    CALCULATIONS FOR EXACT PIXEL LOCATION
1500     XX=XB%:   YY=YB%
1510     X = (XX/128) : 'FIND PIXEL COORDINATE FOR RECORD LOCATION
1520     BDC = XX: IF BDC <=128 THEN 1550         'MODULO 128
1530     BDC = ABS(BDC-128)        :'FIND BEGINNING DATA COUNT IN RECORD
1540     IF BDC>128 THEN GOTO 1530
1550     DC2 =BDC
```

FIG. 12D   FTR.ASC

```
1560      OUTLP1%=YY
1570      GOSUB 2180          'GET RECORD NO.
1580      'RC0=RC
1590      'IF TST$ = "Y" THEN PRINT "RC1, RC0 ";RC1,RC0
1600      'IF RC1 = RC0 THEN 1710
1610      CLOSE #1
1620      OPEN "R",#2,"FILTERED.BIN",128
1630      FIELD 2,128 AS IB$
1640      'IF RC1=0 THEN 1660
1645        ' IB$=IB2$
1650        'PUT #2,RC1: 'PRINT "EXECUTED PUT ";CVI(IB$)
1660        GET #2,RC
1665      'IB2$=IB$
1670      'RC1 = RC0
1680    - 'CLOSE #2
1690      'OPEN "R",#1,"PRESENT.BIN",128
1700      'FIELD 1,128 AS IA$
1710      ' PACK RED, GREEN, BLUE COLORS INTO THEIR RESPECTIVE BYTES
1720              WR1% = WRG1% OR 8 * WRR1%
1730              WR1% = WR1% OR 32 * WRB1%
1740              WR2% = WRG2% OR 8 * WRR2%
1750              WR2% = WR2% OR 32 * WRB2%
1760      N3 = (WR2%*256) OR WR1%              ' PACK 2 BYTES INTO 1 WORD
1770        A$ = MKI$(N3)
1780        'PRINT "N3 ";N3
1790        MID$(IB$,DC2,2)=A$
1795        'PRINT "A$ ";CVI(A$)
1796        PUT #2,RC
1797      CLOSE #2
1798      OPEN "R",#1,"PRESENT.BIN",128
1799      FIELD 1,128 AS IA$
1800      RETURN
1810      '
1820
'**********************************************************************
1830      'SUBROUTINE TO INTERROGATE TERMINAL
1840      A7%=INP (93):  A8%=INP (92)
1850      A7%=A7% AND 2: IF A7%=0 THEN 1940          'DATA READY TEST
1860      A8%=A8% AND 127                            'MASK PARITY BIT
1870      A9%=A8% XOR 127: IF A9%=0 THEN 1930 ELSE 1940    'DELETE TO CP/M
1880      CLOSE #1
1890      OPEN "R",#2,"FILTERED.BIN",128
1900      FIELD 2,128 AS IB$
1910      PUT #2,RC1
1920      CLOSE
1930          SYSTEM
1940      RETURN
1950
'**********************************************************************
1960      '*******
1970      LPRINT: LPRINT: LPRINT "LINE 342": GOTO 2030
1980      '*******
1990      LPRINT: LPRINT: LPRINT "LINE 1265": GOTO 2030
2000      '*******
2010      LPRINT: LPRINT: LPRINT "LINE 2025": GOTO 2030
```

FIG. 12E   FTR.ASC

```
2020      '*******
2030      LPRINT "KRLP1=";KRLP1%, "KPLP1=";KPLP1%,
"OUTLP1=";OUTLP1%, "INLP1="; INLP1%
2040      LPRINT "XB=";XB%, "YB=";YB%, "XE=";XE%, "YE=";YE%
2050      LPRINT "DC=";DC, "RC=";RC, "S1=";S1%, "S2=";S2%, "S3=";S3%
2060      LPRINT "RDG1=";RDG1%, "RDR1=";RDR1%, "RDB1=";RDB1%
2070      LPRINT "RDG2=";RDG2%, "RDR2=";RDR2%, "RDB2=";RDB2%
2080      LPRINT "WRG1=";WRG1%, "WRR1=";WRR1%, "WRB1=";WRB1%
2090      LPRINT "WRG2=";WRG2%, "WRR2=";WRR2%, "WRB2=";WRB2%
2100      LPRINT "WS1=";WS1%,    "WS2=";WS2%,    "WS3=";WS3%
2110      RETURN
2120
'******************************************************************
2130      LPRINT : LPRINT : LPRINT "LINE 236"
2140      LPRINT "W1=";W1%, "W2=";W2%, "W3=";W3%
2150      LPRINT "W4=";W4%, "W5=";W5%, "W6=";W6%
2160      LPRINT "W7=";W7%, "W8=";W8%, "W9=";W9% : RETURN
2170
'******************************************************************
2180                 'DEFINE RECORD NO.
2190      RC = ((OUTLP1%-1)*4)+1            '4-RECORDS/LINE, RECORD-
1 TO RECORD-4
2200      IF (X>1) AND (X<=2) THEN RC=RC+1  'CHECK FOR PIXEL
OVERFLOWING A RECORD
2210      IF (X>2) AND (X<=3) THEN RC=RC+2
2220      IF (X>3) THEN RC=RC+3
2230      RETURN
2240      END
```

FIG. 13A DIS.ASC

```
200        PRINT: PRINT: PRINT "FILE: DIS.ASC, REV. 10/7/4  19:00"
220                    'ADDED ANNOTATIONS AND DELETED UNNECESSARY MATERIAL
240        CLEAR
260        INPUT "MURPHY (M) OR CAMILLE (C)";K2$      'SELECT SYSTEM CONFIGURAT
280        PRINT: PRINT "JOYSTICK BIAS VALUES"        'CALIBRATE JOYSTICKS
300        E%=0
320        FOR A%=2 TO 8 STEP 2: B%=A%-2: OUT 236,B%: C%=INP (237): GOSUB 44
340        NEXT A%
360        IF K2$="C" THEN 400
380        A8%=INP (1): GOTO 420               'KEYBOARD EXIT OF
JOYSTICK CALIBRATE
400        A8%=INP (93)
420        A8%=A8% AND 2: IF A8%=0 THEN 320 ELSE 660
440        '*******************************************************************
460        'SUBROUTINE TO ACQUIRE JOYSTICK VALUES
480        D%=A%/2: ON D% GOTO 500,520,540,580
500              PRINT "SCALE=";C%,: BS5%=C%: GOTO 620
520              PRINT "X="     ;C%,: BX5%=C%: GOTO 620
540              PRINT "ANGLE=";C%,: BA5%=C%: GOTO 620
580              PRINT "Y="     ;C% : BY5%=C%
600              PRINT CHR$ (11);
620        RETURN
640        '*******************************************************************
660 '      PRINT: PR1%=1: PR2%=1: PR5%=128: DB1%=15
680        PR7$="N"            'INPUT "PRINTOUT? 'Y' OR 'N'";PR7$
700        PR9$="Y"            'INPUT "UPDATE EACH FIELD, NOT ALTERNATE
FIELDS; 'Y' OR 'N'";PR9$
720        PR10$="Y"           'INPUT "CLEAR REMAINDERS;   'Y' OR 'N'"; PR10$
740        PR11$="Y"           'INPUT "SLOPE USING CINT ROUNDOFF; 'Y' OR 'N'";PR
760        INPUT "SCALE FACTOR; MIN, MAX; .1 TO 1500; 10,600 IS
NOMINAL";PR12,PR13
780            IF PR12=0 OR PR13=0 THEN 800 ELSE 820
800                PR12=10: PR13=600
820        IF PR9$="Y" GOTO 860      'INTERPOLATE ONCE EACH FIELD OR
ONCE EACH FRAME
840                TS1=1/4: GOTO 880           'NUMBER OF TIME SLICES
860                TS1=1/8
880        INPUT "NEW WINDOW GEOMETRY: 'Y' OR 'N'";PR32$
900        PR16$="F"       'INPUT "INTEGER (I) OR NON-INTEGER (F)
TRANSLATION";PR16$
920        IF PR32$="Y" GOTO 960
940        PRINT: INPUT "OFFSET CENTER OF ROTATION: TX,TY";TX,TY: GOTO 980
960        PRINT: INPUT "OFFSET CENTER OF IMAGE: X1, Y1" ;X1,Y1
980        DB1%=20         'PRINT: INPUT "DEADBAND SELECTION; 20 IS NOMINAL";DB
1000       PR21$="Y"        'PRINT: INPUT "FRACTIONAL INITIAL POINT AND
SLOPES, Y OR N";PR21$
1020       DR=.017453292#: RD=57.29577951000028#
1040       X5V=512: Y5V=482          'VIEWPORT DIMENSIONS
1060       '** ADAPT X5V FOR PIXEL RATE; (54 US)(9.15 MHZ)(16/18 CLOCK WIDTH
1080       X5I=512: Y5I=512          'IMAGE MEMORY DIMENSIONS IN PIXELS
1100 'A    R1=SQR(X5V^2+Y5V^2)       'UNITS OF PIXELS
1120 'A    AP1=ATN(Y5V/X5V)
1140 'A    A6=ATN(X5V/Y5V): AP1=90*DR-A6
1160       KS1%=X5I*8: KS2%=Y5I*8   'IMAGE MEMORY DIMENSIONS IN
EIGHTH PIXELS
```

FIG. 13B   DIS.ASC

```
1180      Q2=(Y5V/2)-TY: Q3=(X5V/2)+TX
1200      IF PR32$="Y" GOTO 1260
1220      AP1=ATN(Q2/Q3): R1=2*SQR(Q2^2+Q3^2)
1240      KB1=R1*8*SIN(AP1)/2: KB2=R1*8*COS(AP1)/2: GOTO 1280
1260      KB1=Q2*8: KB2=Q3*8
1280      DS11=1: JSS%=128
1300      XC1=(X5I/2+X1)*8: YC1=(Y5I/2+Y1)*8: TX=TX*8: TY=TY*8
1320      F6%=1: F7%=0
1340      XSV=1.58          'VIEWPORT ASPECT RATIO
1360      IF PR32$="Y" GOTO 1420
1380      XS=256*XSV : YS=256: YSS=YS*(3.90625E-03):
XSVR=1/(XSV*256)
1400      KSAR=0: KCAR=1: XSSV=XS*XSVR: GOTO 1460
1420      XS=256*XSV : YS=256: YSS=1
1440      KSAR=0: KCAR=1: XSSV=1
1460      FOR E%=1 TO 16: GOSUB 2220: NEXT E%        'INITIAL
CONDITION GENERATION
1480      R%=INP (236): S%=R% AND 1: IF S%=1 THEN 1480      'LOCKUP
ON VERT.SYNC=1
1500      R%=INP (236): S%=R% AND 16: IF S%=0 THEN 1480    'CHECK FIELD
1520      'ITERATIVE PROCESSING
1540      OUT 236,64
1560      'RESYNCHRONIZATION AND FIELD CONTROL PROCESSOR
1580      R%=INP (236): S%=R% AND 1
1600      IF S%=0 THEN 1580          'LOCKUP ON VERT.SYNC=0
1620              'INTERLACED SCAN CALCULATIONS
1640              'INPUT BYTE   128 064 032 016 008 004 002 001
1660              '                     F2      F1      LS      FS
1680      OUT 236,0                   'COMMAND LOAD, RUN-BAR
1700      R%=INP (236): S%=R% AND 16: IF S%=0 THEN 1860 ELSE 1720
'CHECK FIELD
1720                      'FIELD-2
1740          'OUTPUT  POSITION PARAMETERS
1760          OUT 238, 249: OUT 237, CA2%: OUT 236,128: OUT 236,0 'Y-ROW MS]
1780          OUT 238, 250: OUT 237, CB2%: OUT 236,128: OUT 236,0 'Y-ROW LS]
1800          OUT 238, 246: OUT 237, CC2%: OUT 236,128: OUT 236,0 'X-ROW MS]
1820          OUT 238, 247: OUT 237, CD2%: OUT 236,128: OUT 236,0 'X-ROW LS]
1840      GOTO 1980
1860                      'FIELD-1
1880          'OUTPUT  POSITION PARAMETERS
1900          OUT 238, 249: OUT 237, CA1%: OUT 236,128: OUT 236,0 'Y-ROW MS]
1920          OUT 238, 250: OUT 237, CB1%: OUT 236,128: OUT 236,0 'Y-ROW LS]
1940          OUT 238, 246: OUT 237, CC1%: OUT 236,128: OUT 236,0 'X-ROW MS]
1960          OUT 238, 247: OUT 237, CD1%: OUT 236,128: OUT 236,0 'X-ROW LS]
1980          'OUTPUT SLOPE PARAMETERS
2000          OUT 238,242: OUT 237,XPM%: OUT 236,128: OUT 236,0
'X-PIXEL SLOPE MSH
2020          OUT 238,245: OUT 237,YPM%: OUT 236,128: OUT 236,0
'Y-PIXEL SLOPE MSH
2040          OUT 238,248: OUT 237,XRM%: OUT 236,128: OUT 236,0
'X-ROW SLOPE MSH
2060          OUT 238,251: OUT 237,YRM%: OUT 236,128: OUT 236,0
'Y-ROW SLOPE MSH
2080          OUT 238,243: OUT 237,XPL%: OUT 236,128: OUT 236,0
'X-PIXEL SLOPE LSH
```

```
2100        OUT 238,244: OUT 237,YPL%:  OUT 236,128: OUT 236,0
'Y-PIXEL SLOPE LSH
2120        OUT 238,240: OUT 237,XRL%:  OUT 236,128: OUT 236,0
'X-ROW SLOPE LSH
2140        OUT 238,241: OUT 237,YRL%:  OUT 236,128: OUT 236,0
'Y-ROW SLOPE LSH
2160    OUT 236,80   'COMMAND RUN, LOAD-BAR ;PULSE-1 BRACKETING
COMPUTATION PERIOD
2180    GOSUB 2220              'PROCESSING FOLLOWS OUTPUT
2200    GOTO 1520              'LOOP BACK FOR NEXT FIELD
2220 '******SUBROUTINE FOR INTERFIELD PROCESSING
2240    F6%=F6%+1        'INCREMENT TIME SLICE COUNTER
2260    ON F6% GOTO 4000, 4640, 4800, 2280, 2820, 3360, 3440,
3540
2280 '***************************************************************
2300    GOSUB 5220: GOSUB 5840   'INTERPOLATE
2320    'CALCULATE INITIAL POINT
2340      XIP1N%=XC1+TX-KF6-KF4      'EQUIVALENT TO XIP1N%=XC1-
R1*8*COS(A5%)/2
2360 '         IF XIP1N%<0 THEN 5180 ELSE 5220
2380 '              XIP1N%=XIP1N%+KS1%: GOTO 5300   'WRAP AROUND
2400 '         IF XIP1N%>KS1% THEN 5260 ELSE 5300
2420 '              XIP1N%=XIP1N%-KS1%
2440      YIP1N%=YC1+TY+KF7-KF5 'EQUIVALENT TO YPI1%=YC1-R1*8*SIN(A5%)/2
2460 '         IF YIP1N%<0 THEN 5380 ELSE 5420
2480 '              YIP1N%=YIP1N%+KS2%: GOTO 5500   'WRAP-AROUND
2500 '         IF YIP1N%>KS2% THEN 5460 ELSE 5500
2520 '              YIP1N%=YIP1N%-KS2%
2540 '   XIP1N%=XIP1N%-XRN%   'BUFFER MEMORY WITH ANTI-ALIASING
2560 '   YIP1N%=YIP1N%-YRN%
2580    XIP2N%=XIP1N%+XRN%*(.015625)     'XIP1-SF=8, XR%-SF=256;
1/2*(8/256)=1/64
2600    YIP2N%=YIP1N%+YRN%*(.015625)
2620    'JOYSTICK PROCESSOR; MUST OCCUR MORE THAN 100-
MICROSECONDS AFTER FRAME SYNC GOES LOW
2640    OUT 236,66: JSXV%=INP (237): OUT 236,68: JSA%=INP (237)
2660    OUT 236,70: JSYV%=INP (237): OUT 236,64: JSS%=INP (237): OUT 236,
2680    JSXB%=JSXV%-BX5%: JSYB%=JSYV%-BY5%:  JSSB%=JSS%-BS5%:
JSAB%=JSA%-BA5%
2700    IF ABS(JSAB%)<DB1% THEN 2800          'CHECK IF IN DEADBAND
2720       IF JSAB%<0 THEN 2740 ELSE 2760     'BIAS OUT DEADBAND
2740          JSAB%=JSAB%+DB1%: GOTO 2780
2760          JSAB%=JSAB%-DB1%
2780    AR=AR+JSAB%*ABS(JSAB%)*(.00003)     'SQUARE LAW JOY
STICK SCALING
2800    RETURN
2820    '***************************************************************
2840    IF PR9$="N" GOTO 2880
2860          GOSUB 5220: GOSUB 5840   'INTERPOLATION
2880    GOSUB 4980              'KEYBOARD INPUT ROUTINE
2900    IF PR10$="N" THEN 2960
2920          SDXIP1R%=0: SDYIP1R%=0: SDXIP2R%=0: SDYIP2R%=0
2940          SDXPR%=0:    SDYPR%=0:   SDXRR%=0:    SDYRR%=0
2960    DXIP1%=(XIP1N%-XIP1P%): DYIP1%=(YIP1N%-YIP1P%)
2980    DXIP2%=(XIP2N%-XIP2P%): DYIP2%=(YIP2N%-YIP2P%)
```

FIG. 13D DIS.ASC

```
3000    DYP%=(YPN%-YPP%):       DXP%=(XPN%-XPP%)
3020    DYR%=(YRN%-YRP%):       DXR%=(XRN%-XRP%)
3040    'REMAINDER PROCESSING WORKS FOR + AND - DELTA NUMBERS
3060    IF PR9$="Y" GOTO 3180
3080    DXIP1R%=DXIP1% AND 3:   DYIP1R%=DYIP1% AND 3
3100    DXIP2R%=DXIP2% AND 3:   DYIP2R%=DYIP2% AND 3
3120    DXPR%=DXP% AND 3:       DYPR%=DYP% AND 3
3140    DXRR%=DXR% AND 3:       DYRR%=DYR% AND 3
3160    GOTO 3260
3180    DXIP1R%=DXIP1% AND 7:   DYIP1R%=DYIP1% AND 7
3200    DXIP2R%=DXIP2% AND 7:   DYIP2R%=DYIP2% AND 7
3220    DXPR%=DXP% AND 7:       DYPR%=DYP% AND 7
3240    DXRR%=DXR% AND 7:       DYRR%=DYR% AND 7
3260    DXIP1%=DXIP1%*TS1:      DYIP1%=DYIP1%*TS1
3280    DXIP2%=DXIP2%*TS1:      DYIP2%=DYIP2%*TS1
3300    DXP%=DXP%*TS1:          DYP%=DYP%*TS1
3320    DXR%=DXR%*TS1:          DYR%=DYR%*TS1
3340    RETURN
3360    '*********************************************************
3380    GOSUB 5220: GOSUB 5840   'INTERPOLATE
3400    KSAR=SIN(AR)
3420    RETURN
3440    '*********************************************************
3460    IF PR9$="N" GOTO 3500
3480             GOSUB 5220: GOSUB 5840   'INTERPOLATE
3500    KCAR=COS(AR)
3520    RETURN
3540    '*********************************************************
3560    F6%=0              'RESET TIME SLICE COUNTER
3580    GOSUB 5220: GOSUB 5840   'INTERPOLATE, FIRST OPERATION IN
PRIOR TIME SLICE
3600    JSYK%=JSYB%*KSAR: JSXK%=JSXB%*KSAR
3620    JSXB%=JSXB%*KCAR+JSYK%: JSYB%=JSYB%*KCAR-JSXK%
3640    'UPDATE POSITION; PRECEEDS XIP, YIP PROCESSING
3660    IF ABS(JSXB%)<DB1% THEN 3980
3680 '           IF XC1>30000 AND JSXB%<0 THEN 7420      'LIMIT X-
TRANSLATION, SCROLLING
3700 '          IF XC1<-30000 AND JSXB%>0 THEN 7420
3720            IF XC1>30000 THEN 3740 ELSE 3760        'LIMIT X-
TRANSLATION, WRAP-AROUND
3740                 XC1=XC1-32760: GOTO 3800
'(512*8)PIXELS*8 SUBPIXELS-8 SUBPIXELS
3760            IF XC1<-30000 THEN 3780 ELSE 3800
3780                 XC1=XC1+32760
3800            IF JSXB%<0 THEN 3820 ELSE 3840          'BIAS OUT DEADBAND
3820                 JSXB%=JSXB%+DB1%: GOTO 3860
3840                 JSXB%=JSXB%-DB1%
3860            IF PR16$="F" THEN 3960
3880                 DX1=DXR1+JSXB%*ABS(JSXB%)*(.075)
3900                 DXI1=FIX(DX1)
3920                 DXR1=DX1-DXI1
3940                 XC1=XC1-DXI1: GOTO 3980
3960                 XC1=XC1-JSXB%*ABS(JSXB%)*(.075)
3980    RETURN
4000    '*********************************************************
```

```
4020      OUT 236,65          'OUTPUT START PULSE, INCREMENT TIME SLICE COUNTER
4040      IF PR9$="N" GOTO 4080
4060              GOSUB 5220: GOSUB 5840   'INTERPOLATE
4080      IF ABS(JSYB%)<DB1% THEN 4400
4100 '            IF YC1>30000 AND JSYB%>0 THEN 7740        'LIMIT Y-
TRANSLATION, SCROLLING
4120 '            IF YC1<-30000 AND JSYB%<0 THEN 7740
4140             IF YC1>30000 THEN 4160 ELSE 4180          'LIMIT X-
TRANSLATION, WRAP-AROUND
4160                  YC1=YC1-32760: GOTO 4220
4180             IF YC1<-30000 THEN 4200 ELSE 4220
4200             YC1=YC1+32760
4220             IF JSYB%<0 THEN 4240 ELSE 4260            'BIAS OUT DEADBAND
4240                  JSYB%=JSYB%+DB1%: GOTO 4280
4260                  JSYB%=JSYB%-DB1%
4280             IF PR16$="F" THEN 4380
4300                  DY1=DYR1+JSYB%*ABS(JSYB%)*(.075)
4320                  DYI1=FIX(DY1)
4340                  DYR1=DY1-DYI1
4360                  YC1=YC1-DYI1: GOTO 4400
4380                  YC1=YC1+JSYB%*ABS(JSYB%)*(.075)
4400      IF ABS(JSSB%)<DB1% THEN 4620
4420             IF JSSB%<0 THEN 4440 ELSE 4460
4440                  JSSB%=JSSB%+DB1%: GOTO 4480            'BIAS OUT DEADBAND
4460                  JSSB%=JSSB%-DB1%
4480             DS11=1+JSSB%*ABS(JSSB%)*(.00001)          'OFFSET
BINARY TO SIGN BINARY, SCALE, BIAS ABOUT UNITY
4500      IF DS11<1 AND XS<PR12  OR DS11<1 AND YS<PR12   THEN 4620
4520      IF DS11>1 AND XS>PR13 OR DS11>1 AND YS>PR13 THEN 4620
4540        XS=XS*DS11: YS=YS*DS11
4560      IF PR32$="Y" GOTO 4600
4580      YSS=YS*(3.90625E-03): XSSV=XS*XSVR: GOTO 4620
4600      KB1=KB1*DS11: KB2=KB2*DS11
4620      RETURN
4640      '*************************************************************
4660      GOSUB 5220: GOSUB 5840   'INTERPOLATE, CALCULATIONS
PERFORMED IN PRIOR TIME-SLICE
4680      IF PR32$="Y" GOTO 4740
4700      KF6=KB2*KCAR*XSSV: KF7=KB1*KCAR*YSS
4720      KF4=KB1*KSAR*XSSV: KF5=KB2*KSAR*YSS: GOTO 4780
4740      KF6=KB2*KCAR: KF7=KB1*KCAR
4760      KF4=KB1*KSAR: KF5=KB2*KSAR
4780      RETURN
4800 '*************************************************************
4820      IF PR9$="N" GOTO 4860
4840              GOSUB 5220: GOSUB 5840                'INTERPOLATE
4860      IF PR11$="N" THEN 4920
4880      YPN%=CINT(KSAR*XS):     XRN%=CINT(2*KSAR*YS)
'CALCULATE SLOPES
4900      YRN%=-CINT(2*KCAR*YS): XPN%=CINT(KCAR*XS): GOTO 4960
4920      YPN%=KSAR*XS:      XRN%=2*KSAR*YS           'CALCULATE SLOPES
4940      YRN%=-2*KCAR*YS: XPN%=KCAR*XS
4960      RETURN
4980      '*************************************************************
5000      IF K2$="C" THEN 5040                'KEYBOARD COMMANDS
```

FIG. 13F   DIS.ASC

```
5020      A7%=INP (1): A8%=INP (0): GOTO 5060
5040      A7%=INP (93):  A8%=INP (92)
5060      A7%=A7% AND 2: IF A7%=0 THEN 5200        'DATA READY TEST
5080      A8%=A8% AND 127                          'MASK PARITY BIT
5100      A9%=A8% XOR 27: IF A9%=0 THEN 240        'ESCAPE TO MENU
5120      A9%=A8% XOR 74: IF A9%=0 THEN 5140 ELSE 5160      '"J" TO
RECALIBRATE JOYSTICKS
5140          BS5%=JSS%: BX5%=JSXV%: BY5%=JSYV%: BA5%=JSA%: GOTO
5200
5160      A9%=A8% XOR 127: IF A9%=0 THEN 5180 ELSE 5200     'DELETE TO CP/M
5180          SYSTEM
5200      RETURN
5220      '*****************************************************
5240      'INTERPOLATION SUBROUTINE-1
5260      'UPDATE INITIAL POSITIONS AND SLOPES
5280      'REMAINDER PROCESSING
5300      SDXIP1R%=SDXIP1R%+DXIP1R%:  SDYIP1R%=SDYIP1R%+DYIP1R%
5320      SDXIP2R%=SDXIP2R%+DXIP2R%:  SDYIP2R%=SDYIP2R%+DYIP2R%
5340      SDXPR%=SDXPR%+DXPR%:        SDYPR%=SDYPR%+DYPR%
5360      SDXRR%=SDXRR%+DXRR%:        SDYRR%=SDYRR%+DYRR%
5380      'INTERPOLATION DELTA UPDATES
5400      XIP1P%=XIP1P%+DXIP1%: YIP1P%=YIP1P%+DYIP1%
5420      XIP2P%=XIP2P%+DXIP2%: YIP2P%=YIP2P%+DYIP2%
5440      XPP%=XPP%+DXP%:       YPP%=YPP%+DYP%
5460      XRP%=XRP%+DXR%:       YRP%=YRP%+DYR%
5480      IF SDXIP1R%<8 THEN 5520
5500          SDXIP1R%=SDXIP1R%-8: XIP1P%=XIP1P%+1
5520      IF SDYIP1R%<8 THEN 5560
5540          SDYIP1R%=SDYIP1R%-8: YIP1P%=YIP1P%+1
5560      IF SDXIP2R%<8 THEN 5600
5580          SDXIP2R%=SDXIP2R%-8: XIP2P%=XIP2P%+1
5600      IF SDYIP2R%<8 THEN 5640
5620          SDYIP2R%=SDYIP2R%-8: YIP2P%=YIP2P%+1
5640      IF SDXPR%<8 THEN 5680
5660          SDXPR%=SDXPR%-8: XPP%=XPP%+1
5680      IF SDYPR%<8 THEN 5720
5700          SDYPR%=SDYPR%-8: YPP%=YPP%+1
5720      IF SDXRR%<8 THEN 5760
5740          SDXRR%=SDXRR%-8: XRP%=XRP%+1
5760      IF SDYRR%<8 THEN 5800
5780          SDYRR%=SDYRR%-8: YRP%=YRP%+1
5800      '
5820      RETURN
5840      '*********************************************************
5850      'INTERPOLATION SUBROUTINE-2
5860      'FORMAT INITIAL POINT OUTPUTS
5880      IF PR21$="N" THEN 6020
5900      CA1%=YIP1P%*(.015625): CB1%=YIP1P% AND 63:
CC1%=XIP1P%*(.015625): CD1%=XIP1P% AND 63
5920      CA2%=YIP2P%*(.015625): CB2%=YIP2P% AND 63:
CC2%=XIP2P%*(.015625): CD2%=XIP2P% AND 63
5940      'FORMAT SLOPE OUTPUTS
5960      XPM%=XPP%*(.015625): XPL%=XPP% AND 63:
YPM%=YPP%*(.015625): YPL%=YPP% AND 63
5980      XRM%=XRP%*(.015625): XRL%=XRP% AND 63:
```

FIG. 13G DIS.ASC

```
      YRM%=YRP%*(.015625): YRL%=YRP% AND 63
6000      GOTO 6140
6020      'FORMAT IP AND SLOPE AND TRUNCATE TO PIXEL RESOLUTION
6040      CA1%=YIP1P%*(.015625): CB1%=YIP1P% AND 56:
CC1%=XIP1P%*(.015625): CD1%=XIP1P% AND 56
6060      CA2%=YIP2P%*(.015625): CB2%=YIP2P% AND 56:
CC2%=XIP2P%*(.015625): CD2%=XIP2P% AND 56
6080      XPM%=XPP%*(.015625) AND 60: XPL%=XPP% AND 0:
YPM%=YPP%*(.015625) AND 60: YPL%=YPP% AND 0
6100      XRM%=XRP%*(.015625) AND 60: XRL%=XRP% AND 0:
YRM%=YRP%*(.015625) AND 60: YRL%=YRP% AND 0
6120 '
6140      RETURN
6160 '************************************************
6180      END
```